

FORM PTO-130 (REV. 10-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER <u>20-971</u>	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 CFR 1.5) 09/890977	
INTERNATIONAL APPLICATION NO PCT/CB00/00454		INTERNATIONAL FILING DATE February 11, 2000		PRIORITY DATE CLAIMED February 11, 1999	
TITLE OF INVENTION APPARATUS FOR, AND METHOD OF, ENCODING INFORMATION INTO, AND DECODING INFORMATION FROM, A SEQUENCE OF MOVING IMAGES					
APPLICANT(S) FOR DO/EO/US Jia Hong YIN					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.					
2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.					
3. <input checked="" type="checkbox"/> This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).					
4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (PCT Article 31)					
5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2))					
a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau).					
b. <input checked="" type="checkbox"/> has been communicated by the International Bureau.					
c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).					
6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).					
7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))					
a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau).					
b. <input checked="" type="checkbox"/> have been communicated by the International Bureau.					
c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.					
d. <input type="checkbox"/> have not been made and will not be made.					
8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).					
9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).					
10. <input type="checkbox"/> An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).					
Items 11 to 16 below concern document(s) or information included:					
11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.					
12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.					
13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.					
<input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.					
14. <input type="checkbox"/> A substitute specification.					
15. <input type="checkbox"/> A change of power of attorney and/or address letter.					
16. <input type="checkbox"/> Other items or information:					

U.S. APPLICATION NO. 097890977		INTERNATIONAL APPLICATION NO. PCT/GB00/00454		ATTORNEY'S DOCKET NUMBER 20-971	
17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00				CALCULATIONS PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$	860
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	13 - 20 =	0	X \$18.00	\$	0
Independent claims	3 - 3 =	0	X \$80.00	\$	0
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$	0
TOTAL OF ABOVE CALCULATIONS =				\$	860
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$	
SUBTOTAL =				\$	860
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	0
TOTAL NATIONAL FEE =				\$	860
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
TOTAL FEES ENCLOSED =				\$	860
				Amount to be refunded:	\$
				charged:	\$ 860
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>860</u> to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>50-0687</u> . A duplicate copy of this sheet is enclosed. <div style="text-align: center;">(Order No. 20-971)</div>					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO William H. Bollman, Esq. Manelli Denison & Selter PLLC 2000 M Street, NW Suite 700 Washington, DC 20036-3307 Telephone: 202-261-1020 Facsimile: 202-887-0336					
Date: <u>August 8, 2001</u>				<i>W. H. Boll</i> SIGNATURE William H. Bollman	
				NAME 36,457	
				REGISTRATION NUMBER	

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Jia Hong Yin

U.S. Serial No.: **To be assigned**
International Application No.: **PCT/GB00/00454**
International Filing Date: **11 February 2000**
International Priority Date: **11 February 1999**

Title: **APPARATUS FOR, AND METHOD OF, ENCODING INFORMATION INTO, AND DECODING INFORMATION FROM, A SEQUENCE OF MOVING IMAGES**

PRELIMINARY AMENDMENT

Box PCT

Director of the US Patent & Trademark Office
Washington, DC 20231

Dear Sir:

Prior to action in, and calculation of fees for, the above-captioned application, please amend the application as follows:

IN THE SPECIFICATION:

Kindly amend the specification as follows:

Clean Specification

Page 1:

APPARATUS FOR, AND METHOD OF, ENCODING INFORMATION INTO, AND DECODING INFORMATION FROM, A SEQUENCE OF MOVING IMAGES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an apparatus for, and method of, encoding information into and decoding information from a sequence of moving images. The technique of coding information into a sequence of video or

cinematographic images is also known as electronic watermarking. The invention is therefore particularly, but not exclusively, suitable for electronic watermarking all types of media having moving images stored thereon or involving the transmission or broadcast of moving image data.

2. Background

In video broadcasting, data can be in either digital or analogue form. Increasingly data is transmitted in digital form. One reason for this is because larger amounts of data can be transmitted in digital form than in analogue form. Another is because digital signals are less prone to interference and can easily be recovered by using error correction techniques if received images are distorted. However, as side effects of facile access to digital data, complaints of copyright infringement and for tampering or modification of content are increasing.

Page 2:

SUMMARY OF THE INVENTION

According to the present invention there is provided a method of encoding information into a sequence of images; the sequence of images comprising a first image and a subsequent image; the method comprising the steps of: locating an edge in the first image, locating a corresponding edge in a subsequent image, comparing relative positions of the corresponding edges in said images, thereby identifying at least one relatively moving edge; inserting a first code into said moving edge and inserting a second code into said static edge.

Page 4:

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiment of the invention will not be described, by way of examples only, with reference to the Figures in which: --

Page 5:

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

Referring to the Figures, Figures 1 and 2 show block diagrams of an encoder 10 and decoder 20 respectively. The invention will now be described in the encoding sequence with reference to Figure 1. The signal is split into two portions: a moving image signal 22 and a static image signal 23. This can be according to a standard MPEG protocol or a different proprietary image analysis (compression) protocol.

Version with Markings to Show Changes Made

Page 1, below the title, please insert heading -- BACKGROUND OF THE INVENTION --;

Page 1, above line 6, please insert heading -- 1. Field of the Invention --;

Page 1, above line 13, please insert heading -- 2. Background -- ;

Page 2, above line 27, please insert heading -- SUMMARY OF THE INVENTION --;

Page 4, above line 27, please insert heading -- BRIEF DESCRIPTION OF THE DRAWINGS --;

Page 5, above line 17, please insert the heading -- DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS --.

IN THE CLAIMS:

Kindly amend the claims as follows:

Clean Set of Claims

3. Apparatus according to claim 1 wherein means is provided to identify moving and static edges and signals representative of said moving and static image regions are sent via first and second channels so that code is inserted into, or recovered from, either or both of said channels.

4. Apparatus according to claim 1 wherein a first code is inserted into signals in a first channel and a second code is inserted into signals in said second channel.

7. Apparatus according to claim 1 wherein code is inserted into a moving image region of a moving image sequence in such a way that the code is resistant to image compression.

9. Apparatus according to claim 1 wherein the code is inserted into boundaries between regions of different luminance, chrominance or contrast.

11. Apparatus according to claim 1 which is included in video recording, video broadcasting, video viewing equipment; or a television receiving or a set-top box.

12. Apparatus according to claim 1, including a digital imager, arranged to obtain images of moving objects on a static background and to transmit signals indicative of the objects to a location remote from said imager.

Version with Markings to Show Changes Made

Claim 3, line 1, delete "or 2";

Claim 4, line 1, delete ", or claim 3 when dependent on claim 1,";

Claim 7, line 1, delete "any";

Claim 9, line 1, change "claims 1, 7 or 8" to -- claim 1 --;

Delete Claim 10;

Claim 11, line 1, change "any of claims 1 to 9" to -- claim 1 --;

Claim 12, line 1, change "any of claims 1 to 9" to -- claim 1 --;

Delete Claim 14;

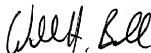
Delete Claim 16.

REMARKS

By the amendment, the multiple dependencies have been removed from dependent claims 3, 4, 9, 11, and 12 so that each claim depends from a single claim and to avoid the fee charged for such claims as originally presented.

Dated: August 8, 2001

Respectfully submitted,



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APPARATUS AND METHOD FOR VIDEOSIGNAL WATERMARKING

5 The present invention relates to an apparatus for, and method of, encoding information into and decoding information from a sequence of moving images. The technique of coding information into a sequence of video or cinematographic images is also known as electronic watermarking. The invention is therefore particularly, but not exclusively,
10 suitable for electronic watermarking all types of media having moving images stored thereon or involving the transmission or broadcast of moving image data.

In video broadcasting, data can be in either digital or analogue form. Increasingly data is transmitted in digital form. One reason for this is because larger amounts of data can be
15 transmitted in digital form than in analogue form. Another is because digital signals are less prone to interference and can easily be recovered by using error correction techniques if received images are distorted. However, as side effects of facile access to digital data, complaints of copyright infringement and for tampering or modification of content are increasing.

20 It is known to insert codes into images for the purpose of identifying the owner of the images. The images may be in the form of video transmissions, or video clips or stills, for example for transmission across a telecommunication link. There are a number of known schemes for inserting identification codes into so called 'sync' periods in transmitted
25 video images. More recently it has been proposed to insert identification codes into the image itself in such a way that the code cannot be detected by a human eye. However, such schemes may suffer from the disadvantage that low pass filtering and other image processes, such as data compression, may remove the code or degrade it to an extent that it cannot be recognised.

30 UK Patent Application GB-A-2 305 803 (Philips) describes a method of correcting errors which occur in a telecine scanning process. The method involves sampling an area of an image which includes a structure and comparing this sampled structure with subsequently

sampled structures obtained from subsequent image frames. Use of motion vectors obtained is then made to correct picture steadiness.

All current schemes suffer from the disadvantage that coded digital information cannot easily be transformed and maintain its integrity. Low pass filtering and other processes, such as data compression, may occur as a result of image compression algorithms or transmission of audio signals across a telecommunication link. Such transforms may remove the code or degrade it to an extent where it cannot be recognised.

In the Applicant's published International Patent Application WO-A1-9625005 (Todd), there is described a method of coding data into an image. The method of coding and decoding information into an image, comprises: dividing the image into $M \times N$ blocks, selectively encoding (decoding) information into selected blocks in such a way as not to be visible to a human eye, wherein in a decoding stage, the decoding is synchronised to the occurrence of the blocks for analysis of image information. In a preferred embodiment the size of insertions and their positions are fixed by processing the image in a block-by-block manner, typically with a block size of 8 by 8 pixels.

In MPEG compression standards, temporal redundancy in image sequences is reduced by block-based motion compensation. Any change in an image from its previous frame caused by object movement is reserved to recover the image in the process of image decompression. Whilst previous encoding techniques have been successful, sometimes embedded codes have not survived MPEG compression.

The present invention arose to overcome this and associated problems.

According to the present invention there is provided a method of encoding information into a sequence of images; the sequence of images comprising a first image and a subsequent image; the method comprising the steps of: locating an edge in the first image, locating a corresponding edge in a subsequent image, comparing relative positions of the corresponding edges in said images, thereby identifying at least one relatively moving edge; inserting a first code into said moving edge and inserting a second code into said static edge.

A corresponding apparatus is also provided.

The invention thus solves the problem of preserving both static and moving encoded information during subsequent image compression. Another advantage of the present invention over the arrangement described in UK Patent Application GB-A-2305 803 (Philips) is the fact that the present invention is capable of diagrammatically encoding watermark code into a signal to be stored, or broadcast.

Preferably the apparatus and method identify moving, and therefore static edges, in an image sequence and treat moving and static edges as separate channels each carrying its own code(s). Hence identification information is encoded into both moving edges (which are not compressed to any extent) and static edges independently. Both channels may carry identical codes if required. Alternatively different codes may be inserted into moving or static edges. The code insertion technique of the present invention may be used to embed codes in moving edge pixels.

Means is advantageously provided to preselect said relative moving edges so that a code can be inserted into switchable sequences. If there is not movement in a sequence of images, no code is inserted and a different sequence may be selected.

Preferably coded information is inserted into an image in so called strongly featured regions of an image in such a way that the code is resistant to image compression and/or low pass filtering, but is not visible to the human eye. Examples of strongly featured regions of images are textured regions or lines, or edges between two regions of different luminance or contrast. In such regions, it is possible to insert a relatively large amount of information without significantly altering the image.

Information encoded into an image may be used for a variety of purposes, for example:

- i) to insert copyright or identification information into video clips or still images;
- ii) to monitor when advertisements or films are played in broadcasts, for monitoring royalty payment purposes;

- iii) to identify a master copy of a data storage medium, such as a CD or DVD or video disc or similar medium, from which pirated copies may be produced.

Codes are preferably inserted in edges within an image. Edge regions are known to have masking properties because of the way the human visual system works. In particular, the local orientation of edges are important, and there are specific structures in the primary visual cortex of the human brain, for detecting the presence of an edge and its local orientation.

- 10 Coded information is preferably inserted into an image so that it does not alter the local orientation of certain features. The insertions are preferably made along the length of a local section of edge. The insertions are preferably made as a 2D function, by using for example an ellipse which is aligned to the local orientation of the edge.

- 15 According to another aspect of the present invention there is provided apparatus for decoding information from an encoded moving image sequence, comprising: means for identifying a region in an image in the sequence, means for determining whether the said region is a moving region or static region and means for recovering code from at least said moving image region.

- 20 Corresponding to this further aspect of the invention, there is also provided a method of decoding information from an encoded moving image sequence.

- There is correspondingly also provided a method of encoding information into, and decoding information from, a moving image sequence, having one or more of the
25 aforementioned preferred features.

Embodiments of the invention will now be described, by way of examples only, with reference to the Figures, in which:-

- 30 Figure 1 shows diagrammatically an embodiment of an encoder according to the invention;

Figure 2 shows an embodiment of a decoder according to the invention;

Figure 3 shows a sketch with edges of images in bold;

Figure 4 shows the sketch of Figure 3, with only moving edges highlighted in bold;

Figure 5 shows diagrammatically an embodiment of the invention, incorporated in a surveillance camera;

Figure 6 is a diagrammatical view of a supermarket in which the surveillance camera of Figure 5 may be used;

Figure 7 is an example of an image of pedestrian flow through a supermarket check-out area; and

Figure 8 is a vector diagram representative of the pedestrian flow of Figure 7.

Referring to the Figures, Figures 1 and 2 show block diagrams of an encoder 10 and decoder 20 respectively. The invention will now be described in the encoding sequence with reference to Figure 1. The signal is split into two portions: a moving image signal 22 and a static image signal 23. This can be according to a standard MPEG protocol or a different proprietary image analysis (compression) protocol.

A first code is inserted into the static image signal and a second code is inserted into the moving image signal. These signals are then transmitted via separate channels.

The moving edge encoding sequence is now described with reference to the following Equations 1 to 3 and Figures 3 and 4.

Moving edges and static edges may be defined as the following:

Let $I_1(x,y)$, $I_2(x,y)$ and $I_3(x,y)$ denote three consecutive images in an image sequence. Let $E_2(x,y)$ be an edge image from image $I_2(x,y)$. The moving edge image $ME(x,y)$ is defined as follows:

$$ME(x,y) = D_{12}(x,y).E_2(x,y).D_{23}(x,y) - (Eqn 1)$$

$$where D_{12}(x,y) = |I_1(x,y) - I_2(x,y)|, D_{23}(x,y) = |I_2(x,y) - I_3(x,y)|. - (Eqn 2)$$

- 5 The static edge image $SE(x,y)$ may be obtained using the following equation:

$$SE(x,y) = \int E_2(x,y), if ME(x,y) = 0$$

- 10 Once inserted the coded information is treated the same as a moving image by any compression algorithm or protocol such as MPEG. Static code is included in early sequences of a series of encoded images so that when compressed the encoded information remains in tact.

- 15 Brief reference will now be made to Figure 2, which depicts a decoder 20. Decoder 20 receives encoded images signal 24. The image signal 24 is split into a moving image signal 26. Edge diffraction then occurs. Edge detector 27 detects edges in moving images. Edge detector 28 detects edges in static images. Detected edge signals 29 and 30 are subtracted one from another at subtractor 31 and a static edge is decoded at static edge decoder 32. Moving edges are decoded directly from a signal presented by moving edge detector 27 to the moving edge decoder 33. Static edge decoded signals 34 and moving edge decoded signals 35 are added at 36 to provide an electronic watermark signal which indicates for example, the origin of a signal or the owner of copyright in an image sequence or piece of video footage.

- 25 The invention may be used to encode information onto all forms of recording media. These may include videotape, video disc, compact disc (CD or DVD), or any other form of video storage medium. Similarly the invention may be incorporated into video broadcasting systems, video editing equipment, video monitoring equipment, televisions, computers or any other piece of electronic equipment used to produce or view video
30 images, including a video cassette recorder and/or a set-top box.

The invention has been described, by way of example only, and it will be understood that variation may be made to the embodiments described without departing from the scope of

the invention. In an alternative embodiment, shown in Figures 5 to 8, the invention may be deployed within shops or other public places in order to monitor activity of purchasers or members of the public. The invention allows for the automation of data capture relating to motion of, say, shoppers and optionally, its subsequent encoding for transmission.

Figure 6 represents the layout of a typical supermarket. The system to be implemented uses real-time video data from appropriately positioned Close Circuit Television (CCTV) cameras to monitor the customers arriving at entrance 102, check-outs 106 and exit 104. The system uses information extracted from video data to estimate net arrival/departure rate of customers and from this maintains an estimate of the number of customers inside the store at any time. This together with the information from the aforementioned areas enables the system to maintain estimates of the number of customers:

- a) within the store shelf area
- b) queuing at the check-outs

In addition a correlation between the number of customers arriving at the check-outs and the number of customers arriving at the store at some earlier time allows the system to adaptively optimise parameters of a prediction model of the store. This optimised prediction model enables the system to estimate impending customer demand for check-outs in advance of the need becoming apparent. This allows for timely staff re-deployment to avoid any reduction in customer service.

Output from the system is preferably in two main forms:

1. Real-time data concerning conditions in the store as they happen. This data in turn may be presented either
 - a) On a screen in some management area, or
 - b) As immediately useful instructions relayed through radio headsets. These instructions need to be unambiguous. It is envisaged at this stage that the instructions consist of messages to open or close a number of check-outs.
2. The system will be capable of producing a statistical report concerning the arrival rate of customers and the length of time they stay in the store. This data will be

suitable for planning overall staff levels and will be a useful source of marketing information.

Imaging equipment may be used in conjunction with a microprocessor dedicated to determining length of queues or regions of a store visited by an unusually large or small number of customers. This may be particularly advantageous in predicting employee allocation at check-outs for example. Similarly the system may be configured to monitor automatically a specific region of a store or even a specific aisle or display. By adapting control and analytical software the system may be arranged to provide a statistical assessment of how popular or unpopular a particular type of marketing or location of a product is performing.

CLAIMS

- 5 1. Apparatus for encoding information into a moving image sequence, comprising:
means for identifying a region in an image in the sequence, means for determining
whether the said region is a moving or static region and means for inserting a
coded into at least said moving image region.
- 10 2. Apparatus for decoding information from an encoded moving image sequence,
comprising: means for identifying a region in an image in the sequence, means for
determining whether the said region is a moving or static region and means for
recovering code from at least said moving image region.
- 15 3. Apparatus according to claim 1 or 2 wherein means is provided to identify moving
and static edges and signals representative of said moving and static image regions
are sent via first and second channels so that code is inserted into, or recovered
from, either or both of said channels.
- 20 4. Apparatus according to claim 1, or claim 3 when dependant on claim 1, wherein a
first code is inserted into signals in a first channel and a second code is inserted
into signals in said second channel.
5. Apparatus according to claim 4 wherein the first and second codes are identical.
- 25 6. Apparatus according to claim 4 wherein the first and second codes are different.
7. Apparatus according to any claim 1 wherein code is inserted into a moving image
region of a moving image sequence in such a way that the code is resistant to
30 image compression.
8. Apparatus according to claim 1 wherein code is inserted into a region of a moving
image so that the code is resistant to low pass filtering.

9. Apparatus according to claims 1, 7 or 8 wherein the code is inserted into boundaries between regions of different luminance, chrominance or contrast.
- 5 10. Apparatus substantially as herein described and with reference to the Figures.
11. Apparatus according to any of claims 1 to 9 which is included in video recording, video broadcasting, video viewing equipment; or a television receiving or a set-top box.
- 10 12. Apparatus according to any of claims 1 to 9, including a digital imager, arranged to obtain images of moving objects on a static background and to transmit signals indicative of the objects to a location remote from said imager.
- 15 13. Apparatus according to claim 12 operating under control of software for statistically analysing said code, so as to provide an indicator of the amount of movement of the objects during a chosen time interval.
- 20 14. A method of encoding information into, or decoding information from, a moving image sequence using the apparatus of claims 1 to 9.
- 25 15. A method of encoding information into a sequence of images; the sequence of images comprising: a first image and a subsequent image, the method comprising the steps of: locating an edge in the first image, locating a corresponding edge in the subsequent image, comparing relative positions of the corresponding edges in said first and second images, thereby identifying either a relatively static edge or two relatively moving images; inserting a first code into said moving edge and inserting a second code into said static edge.
- 30 16. A medium storing a video or cinematographic image or sequence of images thereon, characterised in that a code has been inserted into selective portions of said images, according to the method of claim 14, when dependant on claims 1 or claims 4 to 9, or claim 15.

Fig.1.

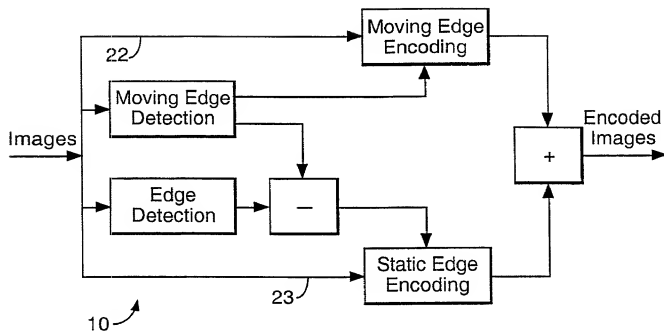
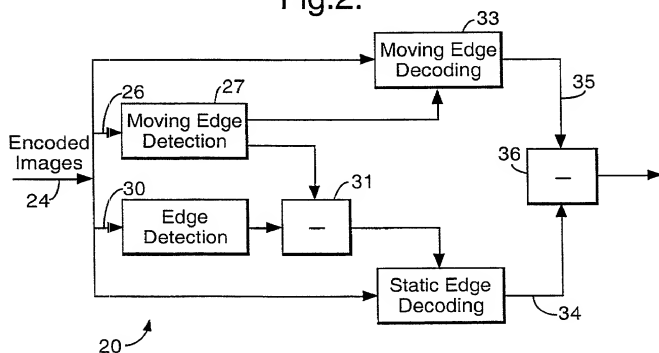


Fig.2.



2/5

Fig.3.

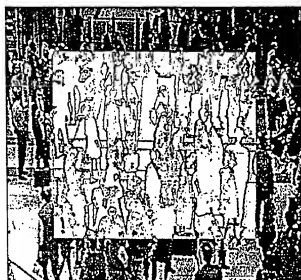
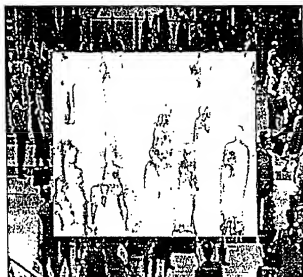
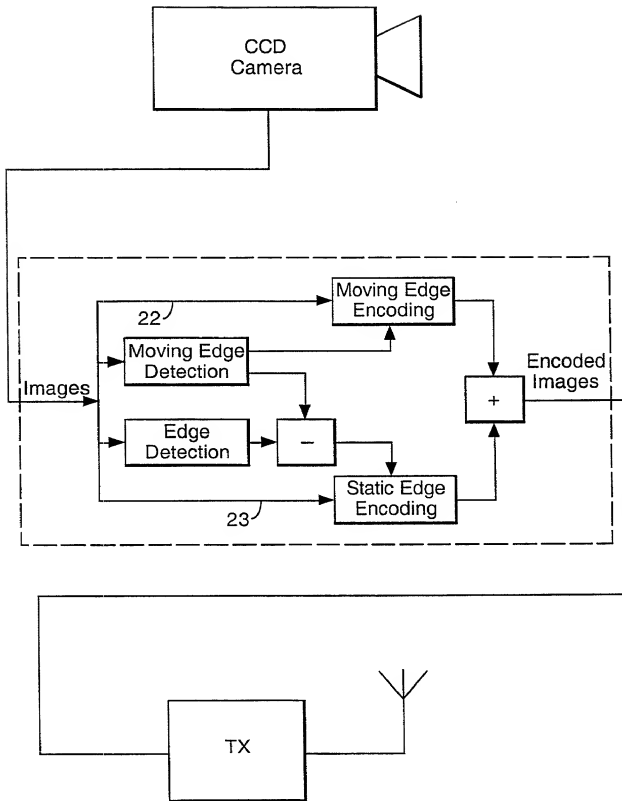


Fig.4.



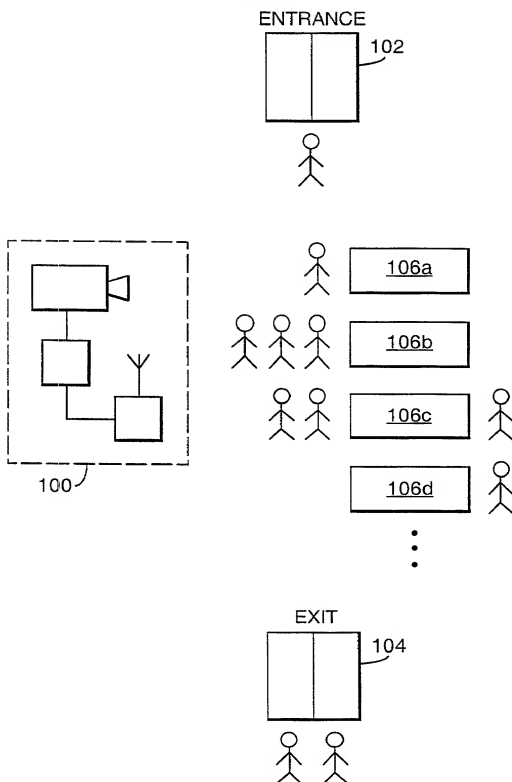
3/5

Fig.5.



4/5

Fig.6.



5/5

Fig.7.

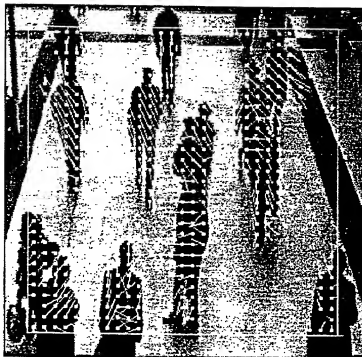
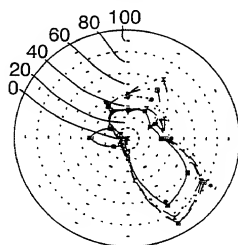


Fig.8.



→t1 →t2 →t3 →t4 →t5

#3

IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

Declaration and Power of Attorney (Sole Inventor)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe that I am the original, first and sole inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled Apparatus for, and method of, encoding information into, and decoding information from, a sequence of moving images

the specification of which; ☐ is being filed herewith.

☒ was filed on August 8, 2001 as Application No. 09/890,977

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by an amendment, if any, specifically referred to in this oath or declaration.

I acknowledge the duty to disclose all information known to me which is material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

I hereby claim the benefit under Title 35, United States Code, 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

DECLARATION OF INVENTOR

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorneys with full power of substitution and revocation, to prosecute said application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent and Trademark Office connected therewith:

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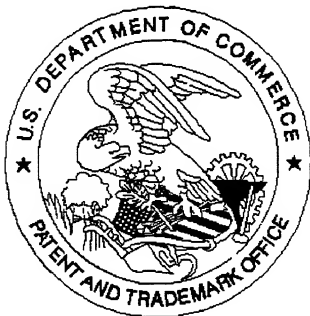
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